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Civil Defense Research
Psychological Laboratories
University of Georgia
Athens, Georgia

31 December, 1963

A SUMMARY OF THE

FINAL REPORT

SHELTER OCCUPANCY STUDIES
AT THE UNIVERSITY OF GEORGIA

1962-1963

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OCD REVIEW NOTICE

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Prepared for
Office of Civil Defense
Department of Defense
under
Contract No. OCD-OS-62-226
Subtask 1521A

Abstract

During 1962 and 1963 the University of Georgia Psychological Laboratories conducted a series of tests on the habitability of fallout shelters as presently stocked in accordance with the National Shelter Program. These studies surpassed in austerity all previous shelter research using civilians. Men, women, and children, age 7 - 70 years, participated in two-week confinement tests.

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I. Introduction

In the summer of 1962 a realistic program for national civil defense was well underway. At that time it was estimated that approximately 235 million spaces were needed by 1967 for nationwide protection from radioactive fallout, in the event of a nuclear war.

The objectives of the National Shelter Program were to locate and mark suitable fallout shelter spaces, and then to stock them with food, water, medical kits, sanitation kits, and radiation measuring instruments. However, the operability of shelters so created and provisioned had never been tested. This task was assigned to the University of Georgia Psychological Laboratories.

The general research mission, therefore, was to appraise minimal survival conditions in public fallout shelters as presently equipped and stocked with emergency supplies. Specifically, the project was to evaluate the interactive effects of such variables as overloading, limited bunks and bedding, emergency sanitation equipment, marginal ventilation conditions, and minimal food and water supplies. A film depicting results was also part of the research mission.

The first phase of the project involved construction of simulated fallout shelter facilities and instruments. The University of Georgia provided a building, administrative office space, shelter operation facilities, and experimental equipment.

Operational responsibility was divided among four task groups: Electronics Design and Development Group, Publicity and Recruitment Group, Pre- and Post-Shelter Behavioral Analysis Group, and an In-Shelter Behavioral Analysis Group.

Following three preliminary pilot studies, four main experimental studies were conducted during the spring and summer of 1963. During these studies, the Psychological Laboratories was visited by Assistant Secretary of Defense Stuart L. Pittman, accompanied by Mr. W. E. Strobe, Director for Research, OCD, and Mr. Fred Carr, Project Coordinator.

II. Outline of Studies

A. Pilot Studies

Pilot studies were conducted in the fall of 1962 for purposes of (a) checking out equipment, (b) training observer teams, (c) determining procedures for medical, physical fitness, and psychological testing of shelterees before and after shelter confinement, (d) training shelter managers, and (e) determining in-shelter activity programs.

B. Experimental Studies

A four-day study (ES I), two two-week studies (ES II and III), and a one-week study (ES IV) were conducted.

Experimental Study I, the four-day study, was the most austere. The shelterees subsisted on fewer calories (315 cal./person/day) and slept on a concrete floor, which, in the other studies, was covered with corrugated fiberboard. The eight defections occurring during ES I indicated that less austere conditions might persuade a greater number of shelterees to endure the longer stay of the other planned studies.

Experimental Studies II and III, therefore, provided 3/16" thickness of corrugated fiberboard as floor covering and additional food and water. The age ranges were also extended in these studies (7-67 years).

Experimental Study IV was designed as a one-week elementary school occupancy study. Two adults, a shelter manager and a nurse, accompanied twenty-eight children. The OCD carbohydrate supplement was also tested in this study. Space was reduced to 6 sq. ft./occupant, to evaluate greater over-crowding, in consideration of the smaller body size of children.

Shelter supplies evaluated in the four studies were standard OCD issue as presently stocked. The four types of food ration, viz., the Bulgur wheat wafer, the Nabisco wheat-flour biscuit, the Nebraska wheat-corn-flour cracker, and the carbohydrate supplement were also investigated. Other supplies studied included sanitation kits, medical kits, and various kinds of commode chemicals. Minimal living space and limited conditions of ventilation were investigated, as well as in-shelter activity programs, and psychological and sociological patterns of behavior.

III. Conclusions

Specific Conclusions

The following statements are in reference to the conditions under which the occupancy tests were conducted. Caution should be exerted in extrapolating these findings to realistic conditions of actual nuclear war.

A. Experimental Variables

1. Space - Eight square feet per person, exclusive of storage, although uncomfortable, would appear to be

adequate for the community fallout shelter, six square feet per person for children in the elementary school fallout shelter. These conclusions are restricted to optimal temperature and adequate ventilation conditions.

2. Water - Under optimal temperature conditions, an average of 1 qt./person/day of water is adequate for a two-week occupancy period.
3. Food - Under optimal temperature conditions, an average of 814 cal./person/day of OCD survival rations without adjuncts is adequate in maintaining good physiological condition for a two-week occupancy period.
4. Sleeping Conditions - Corrugated fiberboard pallets provide an uncomfortable but adequate sleeping surface, although blankets would be a valuable addition to shelter supplies. Bunks are unnecessary unless vertical utilization of space is desired.
5. Sanitation - The commode chemical provided for use in the chemical toilet is inadequate in removing toilet odor as a primary complaint, but is satisfactory in combination with sodium nitrate. The hand cleaner, though functional, does not remove the appearance of dirt, and leaves a "greasy" film.

B. Defections

1. Shelterees exiting prior to study completion (26 of 120 participants) did so primarily for reasons of psychological instability, and inability or unwillingness to adjust.
2. Headaches, body aches, and nausea were secondary reasons for early exit.

C. Shelteree Reactions

1. Pre-Shelter Questionnaire

The following conclusions are based on statements of shelterees on a questionnaire given prior to entry:

- a. Primary motivation for study participation was interest in nuclear survival.
- b. The majority of shelterees were inadequately prepared for survival.

- c. The public school system proved the most fruitful means of shelter participant recruitment.
- d. Shelterees anticipated sleeping conditions as the source of greatest shelter discomfort.

2. Shelter Diaries

- a. In the two-week studies the occupants reached their lowest morale level at the midpoint of the occupancy period, i.e., at the end of the first week.
- b. When depression did occur, it was highest in the morning hours, and diminished toward the end of the day.

3. Medical Complaints

- a. Headache was the most frequent in-shelter medical complaint, followed by colds, sore throats, nausea, and homesickness (in the children's study).
- b. Frequency of complaints decreased as occupancy continued.
- c. Nearly all medical complaints were resolved by the use of aspirin.

4. Post-Shelter Questionnaire

The following conclusions were indicated in the responses received on a questionnaire given upon completion of the occupancy period:

- a. More than 80% of the shelterees expressed satisfaction with having volunteered for confinement; more than 60% were willing to volunteer again; and less than 50% reported confinement to be a personal hardship.
- b. Shelterees participating in the longer confinement studies gave longer estimates of endurance for extended stay than those shelterees participating in studies of shorter duration. Estimates given by men exceeded those of the women and children.

- c. Primary discomfort factors were sleeping conditions, lack of bathing facilities, odors, the chemical toilet, uncomfortable temperature, lack of space, and food.

5. Sociometric Analysis

Evaluation by the shelterees of each other indicated the following conclusions:

- a. The older adults provided a stabilizing influence in the shelter.
- b. The encouragement of individual talent and initiative appeared imperative in the formation of a satisfactorily interested and active shelter group.
- c. Abilities not usually emphasized outside of confinement were welcomed under the shelter conditions, and contributed greatly to group morale.
- d. Leadership appeared to come most readily from older teenagers and young adults.

D. Behavioral Measures

1. Activity - Activity declines from a relatively high level upon shelter entry to a low point about midway in a study.
2. Noise - The noise level parallels the activity level to the midpoint of a study, then continues a gradual decline.
3. Knowledge of Time - Activity and noise levels of groups provided with knowledge of time of day correlate highly with those of groups deprived of such information.
4. Bodily Positions - Approximately one-half of shelter time is spent in the lying position, one-third in the sitting position, and one-sixth in the standing position.
5. Activity Patterns - The most time-consuming activities were sleep, quiet reflection, conversation, and recreation.

6. Trends in Behavior - No marked trends were noted in bodily positions and activity patterns, indicating a fairly consistent physiological state throughout confinement.
7. Perception of Time - Time passed rapidly during the first few days of confinement, and more slowly during the latter part of occupancy.

E. Environmental Measures

1. Shelterees requested higher preferred temperatures as the occupancy period continued, indicating an increasingly greater sensitivity to lower temperatures.
2. Higher temperatures were preferred during the night than during the day.
3. Thermal characteristics of the simulated shelter required increased ventilation during daytime hours to keep temperature and humidity optimal, a specified experimental condition.

F. Pre- and Post-Shelter Testing

1. Medical Examination - Other than a weight loss, recovered within two weeks, shelterees emerged in good physical condition on completion of confinement.
2. Physical Fitness - No deleterious effects were observed in physical fitness, psychomotor performance, visual motor coordination, depth perception, and dynamic balance.
3. Psychological Testing - No attenuation of mental abilities, attention span, concentration, or mental efficiency was indicated in test results. Neither were there any adverse effects on personal-social adjustment scores as a result of shelter confinement.

General Conclusions

- A. Healthy men, women, and children can endure two weeks' isolated shelter confinement under conditions of severe austerity without suffering deleterious physiological or psychological effects.
- B. OCD supplies as presently stocked in public fallout shelters appear to be sufficient for healthy men, women, and children for a two-week survival period.

IV. Implications for Further Research

The occupancy studies conducted to date at the University of Georgia have indicated the adequacy of presently stocked OCD supplies for the maintenance of good physiological state of healthy men, women, and children. It was also found that no deleterious psychological or social effects occur from two-week periods of group confinement under austere conditions.

By the spring of 1963, it was apparent to the Georgia researchers that certain aspects of occupancy research had emerged as pivotal points for future research. These aspects were at that time presented to the Office of Civil Defense as follows: (1) the development of an in-shelter activity program that would (a) help occupants to adjust rapidly to shelter life, and (b) prepare them for immediate adjustment to the post-attack world upon emergence; (2) the development of an abbreviated yet realistic shelter manager training course to be implemented on a nationwide basis in event of a sudden nuclear emergency; (3) the development of an in-shelter handbook for use by groups without a trained shelter manager; (4) continual assessment of changes in the OCD stocking policy. It was further recommended that these four areas be evaluated experimentally.

A. In-Shelter Program

The need for a good in-shelter program is obvious. However, there can be various emphases placed on the orientation of such a program. The Georgia researchers believe that training involving shelter adjustment can be effected within a few days; the program should then be oriented toward adjustment to the post-attack world. This training involves both the empirical knowledge of physical adjustment, e.g., decontamination techniques, sources of stored food supplies, etc., and also psychological preparation, i.e., strengthening of morale and motivation, so that upon emergence the civilian population will "turn to" and exert maximal effort toward national stabilization.

B. Shelter Manager Training

The historical record of the U. S. indicates a reluctance in preparing for war. The public attitude toward civil defense seems to indicate a slowness in implementing a civilian training program. There is a real possibility, therefore, that this nation will suddenly encounter a nuclear emergency without sufficient civilian preparation for fallout shelter living. Consequently, and realistically, it would appear advisable

to have ready a practical short course, crash program-type of shelter manager training, amenable to instant nationwide implementation. This program might conceivably be reduced to a one-day indoctrination in the essentials of survival.

C. Shelter Handbook

The severest assumption, of course, is that the civilian population will be totally unprepared and suddenly thrust into the community fallout shelter situation. This possibility should be realistically met. A solution would be a handbook to be placed in all fallout shelters as part of standard stocking procedures. The handbook would be constructed in such a way that it could be implemented by the naive shelter leader with average intelligence. Followed faithfully, the content of the manual would insure in-shelter training and adjustment, as well as adequate planning for post-shelter emergence.

All of the above aspects of civil defense research should be investigated experimentally. To survey the literature and write manuals are only preliminary steps. Experimental validation is the best means of assessing the value of civil defense preparedness. Obviously, the true attack situation can never be experimentally created; nevertheless, many aspects can be successfully simulated. Those aspects of civil defense which can be experimentally evaluated should be. In accordance with this policy, the Civil Defense Research Staff at the University of Georgia is planning for a 300-person occupancy study, in anticipation of a subsequent 1,000-person occupancy study.